Kruger Contract – ANITA Mox Process for Side Stream Treatment

Department of Water Management

March 7, 2013

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Department of Water Management

Jordan Lake Rules
Impacts for South Durham WRF

Total Nitrogen

Current Limits - 334,704 lbs/year

5.5 mg/l at permitted flows (20 MGD)

12.57 mg/l at current flows (8.75 MGD)

2018 Limits* - 185,345 lbs/year

3.0 mg/l at permitted flows

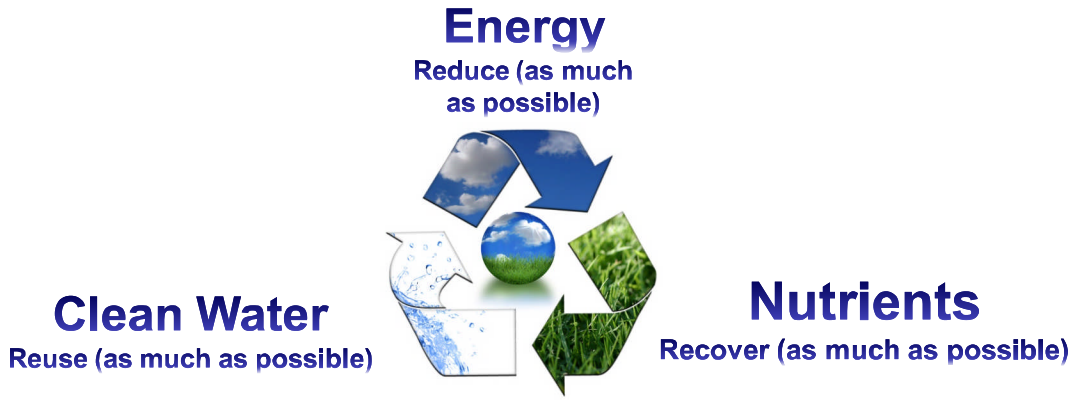
6.95 mg/l at current flows

2012 annual average discharge – 9.9 mg/l or 263,844 lbs at 8.75 MGD (79% of current permitted load)

* Based on Cape Fear Basin Water Quality Model using data 1997 - 2001

Scope of WRF Master Plans

- 20-year planning period
- Long-term Compliance Evaluation to look beyond 20 years
- Near Term Compliance and Smart Infrastructure investments to meet future regulations
- Falls Lake Rules which impact NDWRF
- Jordan Lake Rules which impact SDWRF



General Approach

South Durham Capital Upgrades

Funding Year	Project Name	Project Costs
FY11-12	Nutrient Analyzers and Weir Covers	$711,284
FY12-13	Chemical Systems and Nutrient Related Improvements	$4,260,000
FY12-13	Sidestream Annamox Treatment Facilities	$2,060,100
FY13-14	Odor Control and Influent Junction Box Improvements	$405,000
FY13-14	Stagecoach Road Pump Station Improvements	$378,000
FY13-14	Fine Bubble Diffuser Upgrades	$1,755,000
FY14-15	Tertiary Filter Media Replacement	$675,000
FY14-15	Equalization Facilities	$2,025,000
FY14-15	Secondary Clarifier Improvements	$3,138,750
FY15-16	Dewatering Capacity Improvements	$2,646,000
FY15-16	Influent Screening and Grit Removal Facilities	$9,720,000
FY 15-16	Ultraviolet Disinfection System Replacement	$4,590,000
FY 20-21	Primary Clarification Facilities	$7,695,000
FY 20-21	Master Plan Update 2020	$500,000
FY 20-21	FOG Receiving Station	$3,510,000
FY 20-21	Dewatering Facility Equipment Replacement	$5,292,000
FY 20-21	Struvite Recovery Facilities	$4,590,000

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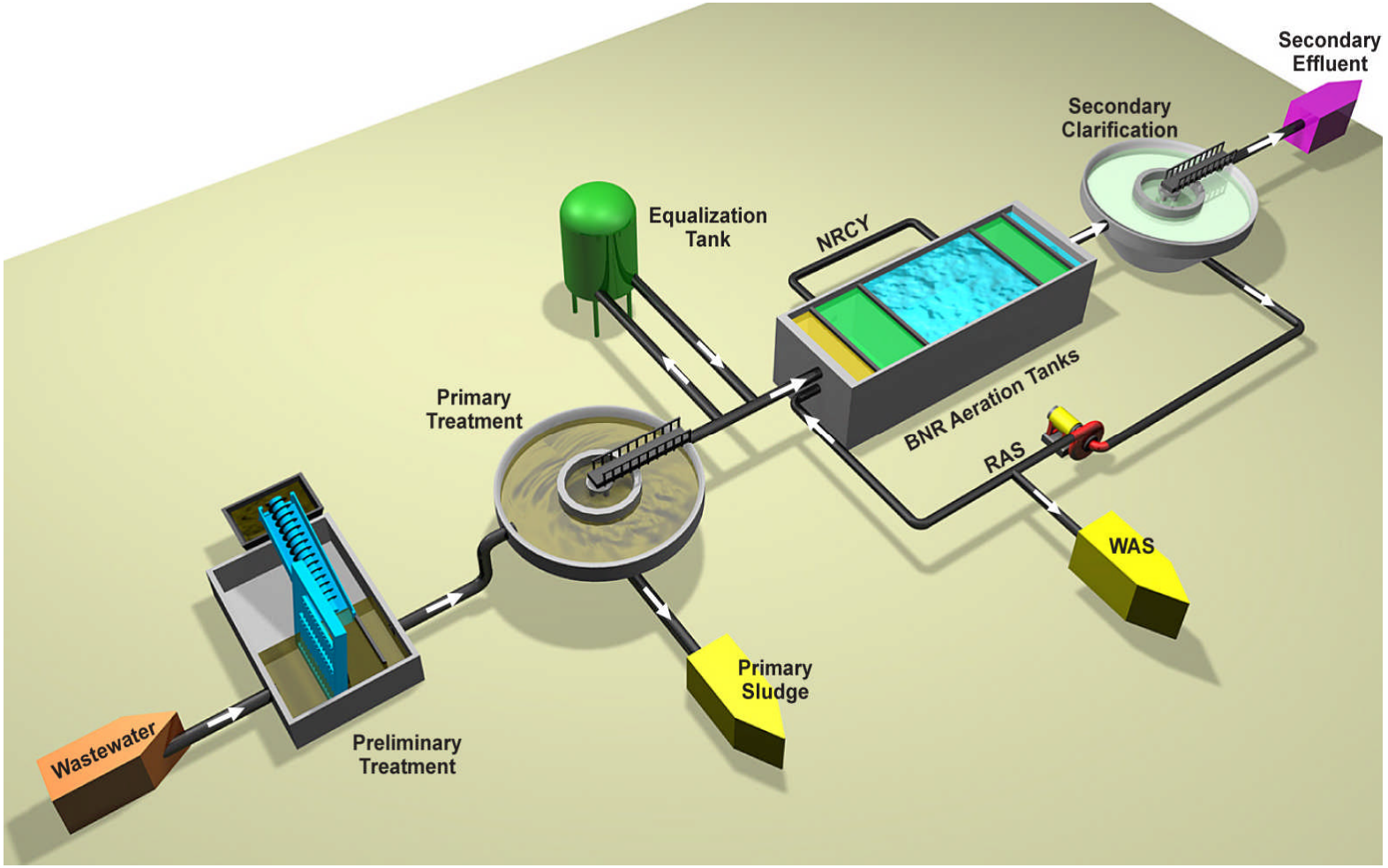
Typical Wastewater Process



TRL1
TRL2

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What is a Side Stream?

- Any process flow resulting from the treatment of biosolids that flows back into the liquid treatment train
- Examples
  - Belt Filter Press filtrate (highest N)
  - Gravity Belt Thickeners filtrate
  - Filter backwash

Site	Percent of Total Influent Nitrogen Load	Percent of Total Influent Phosphorus Load
NDWRF	20%	26%
SDWRF	21%	30%

Slide 6

TRL1 Taylor, Ronald L., 4/1/2011

TRL2 Do we think filter backwash needs SS treatment at Durham?
Why are some items red?
Taylor, Ronald L., 4/1/2011

What is Side Stream Treatment?

- Used to achieve nutrient removal objectives
- More cost effective for nutrient removal
- Nutrient recovery for potential reuse
- Typical side stream treatment options:
  - Chemical phosphorus precipitation
  - Struvite recovery
  - Bioaugmentation
  - Nitritation/denitritation
  - Nitritation/deammonification (Annamox)

Why Consider Side Stream Treatment?

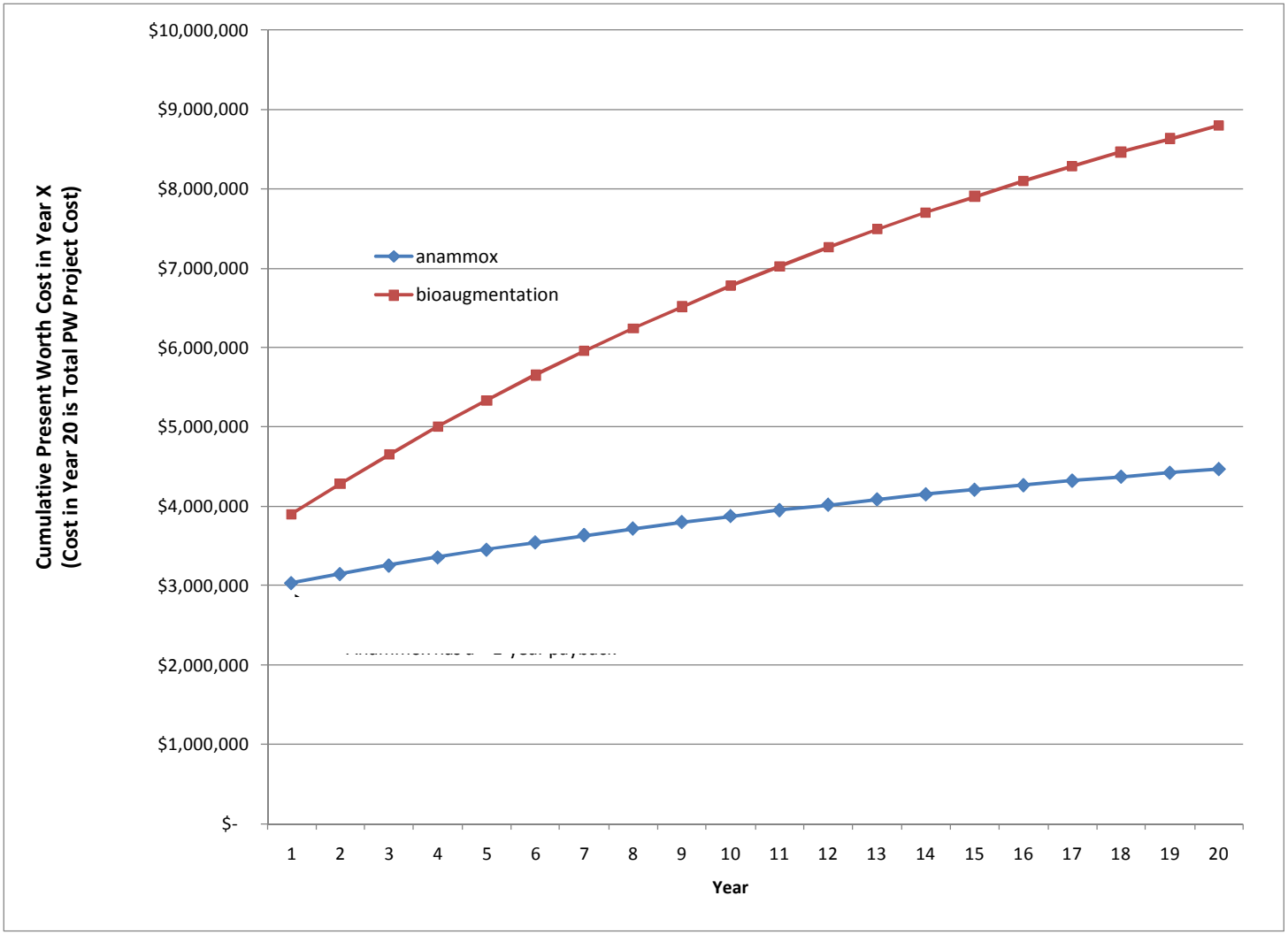
- Process Stability
- Cost Effectiveness

Category/Parameter	Units	Mainstream (5-stage BNR + Tertiary Denitrification)	Bioaugmentation	AnitaMox
Cost per pound N removed (capital)	$/lb	$1.63	$0.82	$0.74
Cost per pound N removed (O&M)	$/lb	$1.68	$1.32	$0.39
Total	$/lb	$3.31	$2.14	$1.13

Summary of Sidestream Nitrogen Removal Evaluation

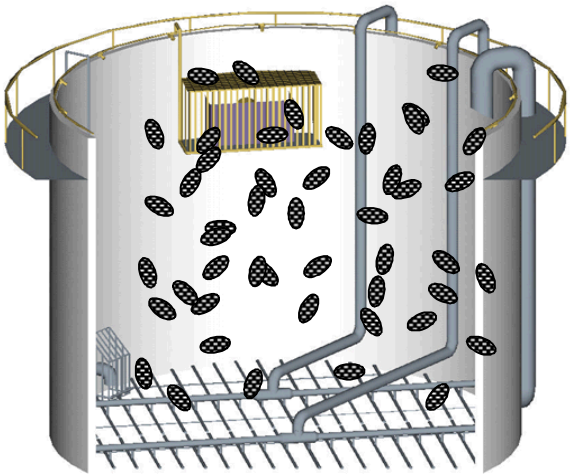
- Total capital investment for Durham for ANITA Mox and bioaugmentation comparable
- ANITA Mox has lower O&M costs providing long-term cost savings
- Demonstrate success with ANITA Mox at one plant, implement at the other soon thereafter
- Kruger offering financial incentives to fast-track this project

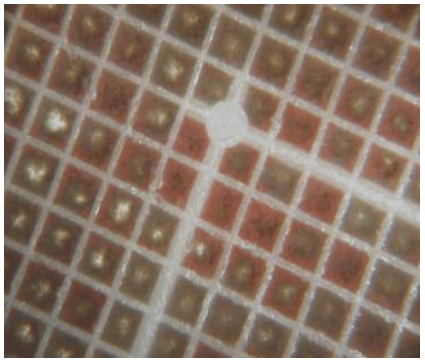
ANITA Mox Evaluation



Schematic of ANITA Mox Internal Components

- ANITA™ Mox is an application of the MBBR technology
- Bacteria grow as a biofilm
- Single-pass reactor
- No clarifier needed
- Dissolved Oxygen between 1.0 – 2.5 mg/L
- Nitritation and deammonification occur in same reactor





General Terms of Contract

- Media, Aeration/Mixing equipment, Controls
- Startup assistance, on going support and training
- Process Guarantee and Standard equipment warranty
- Liquidated damages for process upsets
- Termination clauses if farming agreement becomes onerous.

Contract for Farming Media

- Kruger needs a stateside source of seeded media.
- Kruger wants a local municipality that it can use to seed media for future installations.
- Kruger equipment and process is offered with a process guarantee that will discount final payment if plants do not achieve the savings proposed.
- Kruger would be liable for process interruptions which require the WRF to spend more on the mainstream treatment of nitrogen.
- Purchase price discount ~25%

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Questions